OAKLAND COUNTY
MICHIGAN
HEALTH DIVISION

LYME DISEASE
IN OAKLAND COUNTY

2012-2023

Communicable Disease Unit • July 2024

Introduction

The intent of this report is to inform medical professionals, veterinarians, and citizens of the increased risk of Lyme disease in Oakland County. This report will detail yearly case trends, seasonality, county where exposures likely occurred, demographic distributions, and counseling, testing, treatment, and post exposure prophylaxis recommendations for providers.

Methods

Data was collected from the Michigan Disease Surveillance System for all Lyme Disease cases in Oakland County from 2012 to 2023 with the case classification of Confirmed, Probable, or Suspect per the Council of State and Territorial Epidemiologists (CSTE) case definition ((CDC), 2021). Only cases with an Oakland County address were used in this report. Onset date was used for analysis when available. If the onset date was unknown, then referral date was used. In this report, “sex” is the reported sex of the person at birth and does not represent gender identity.

Case investigations were attempted on all reported positive laboratory results for individuals that live in Oakland County by Oakland County Health Division (OCHD) Communicable Disease (CD) unit public health nurses.

Statistical analysis and visuals were created using RStudio (version 2022.12.0+353).

Trends of Lyme Disease in Oakland County

In 2023, Oakland County experienced the largest number of Confirmed, Probable, and Suspect cases of Lyme disease to date, as shown in Figure 1 and Figure 2. The largest increase in cases was 360% from 2020 to 2021; however, there was a 75% increase from 2022 to 2023 and a 22% increase when comparing 2021 to 2023. This represents an overall increasing trend for the county.

Figure 1 • Lyme Disease Cases

Confirmed, Probable, and Suspect • Oakland County 2013 - 2023

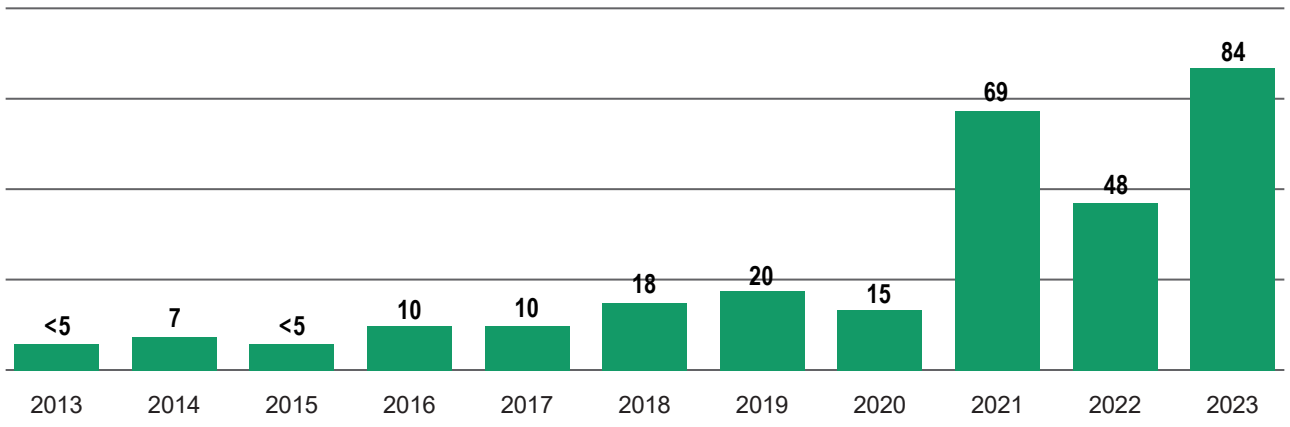
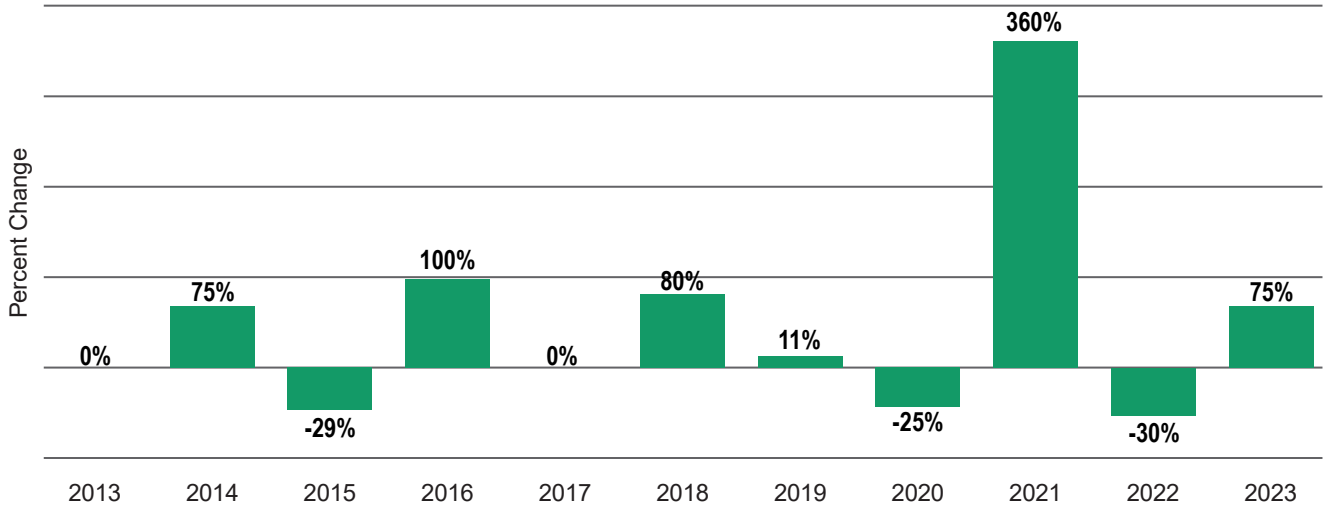


Figure 2 • Percentage Change in Case Count from Previous Year

Lyme Disease • Oakland County 2013 - 2023



Climate change is one possible contributing factor to the increase in Lyme cases in Oakland County ((EPA), 2024). Warmer and shorter winters are causing the range of tick habitats to expand, also causing a greater period of time for human to tick interactions to occur (Beard, 2016). Increases in tick populations and Lyme disease incidence should be expected.

Seasonality

In Michigan, the greatest number of nymph blacklegged ticks occurs in June ((MDHHS), 2023). Blacklegged ticks in the nymph stage are approximately the size of a poppy seed and often go unseen when attached to their host. Because ticks need to be attached for approximately 24 hours to transmit Lyme bacteria (Borrelia burgdorferi), ticks in the nymphal life stage are an especially important determinant in the seasonality and transmission of Lyme disease (CDC, Lyme Disease: How Lyme Spreads, 2024). In Oakland County, Lyme disease peaks in the summer with July having the most cases as of 2023 (Figure 3, 4).

Figure 3 • Lyme Disease Cases

Oakland County 2013 - 2023

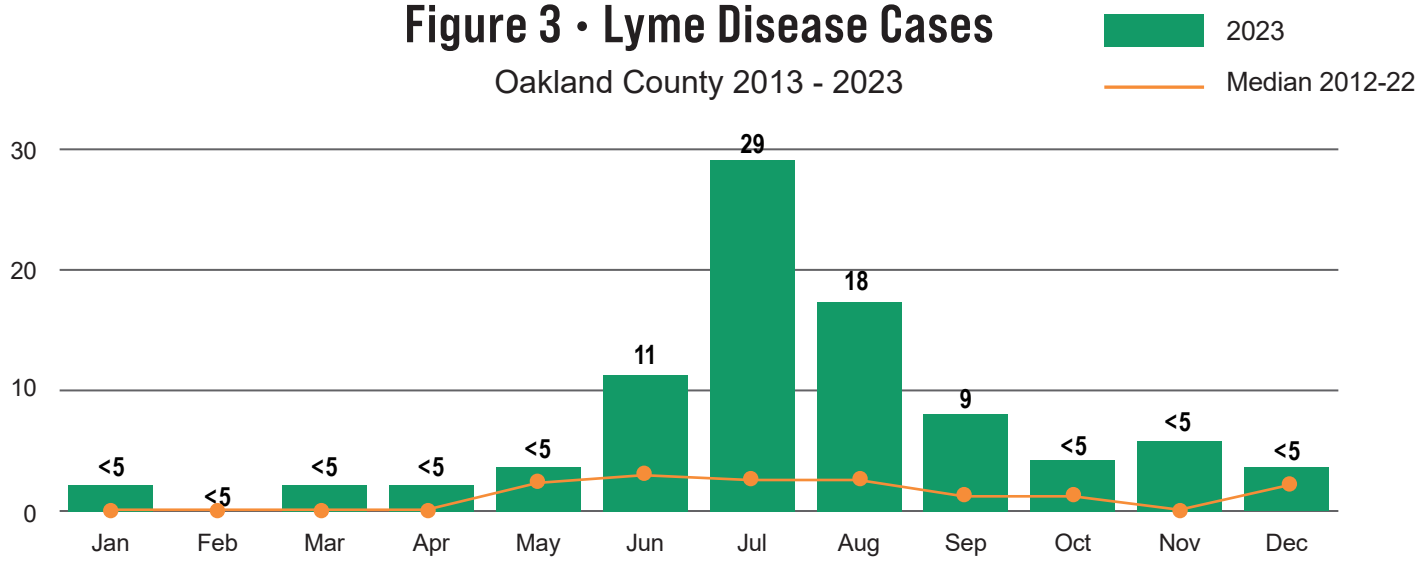
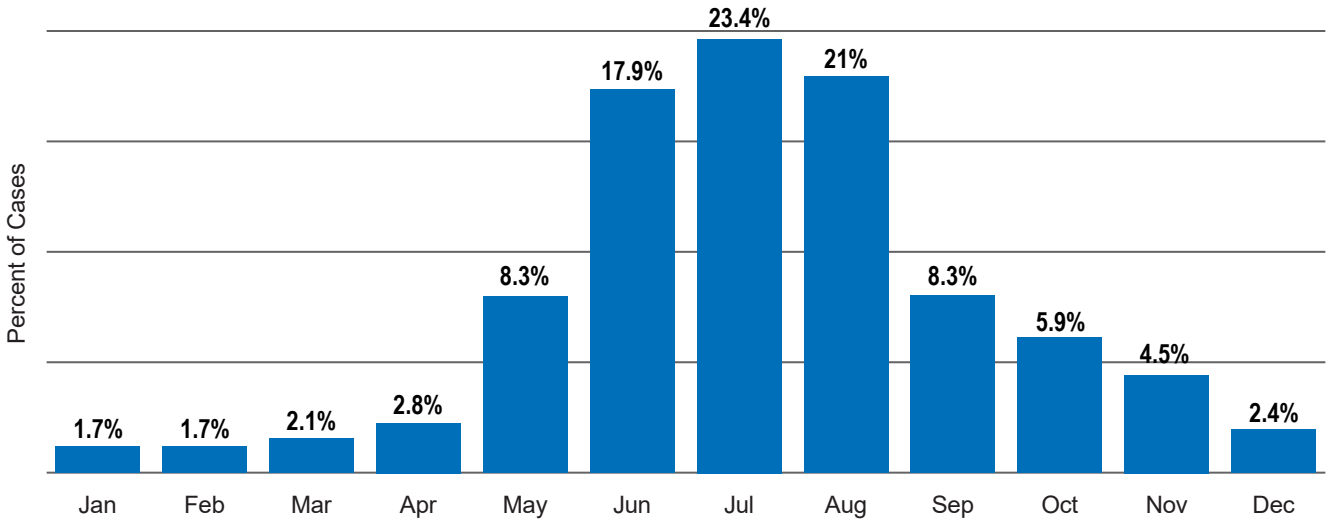


Figure 4 • Lyme Disease Seasonality

Oakland County 2013 - 2023

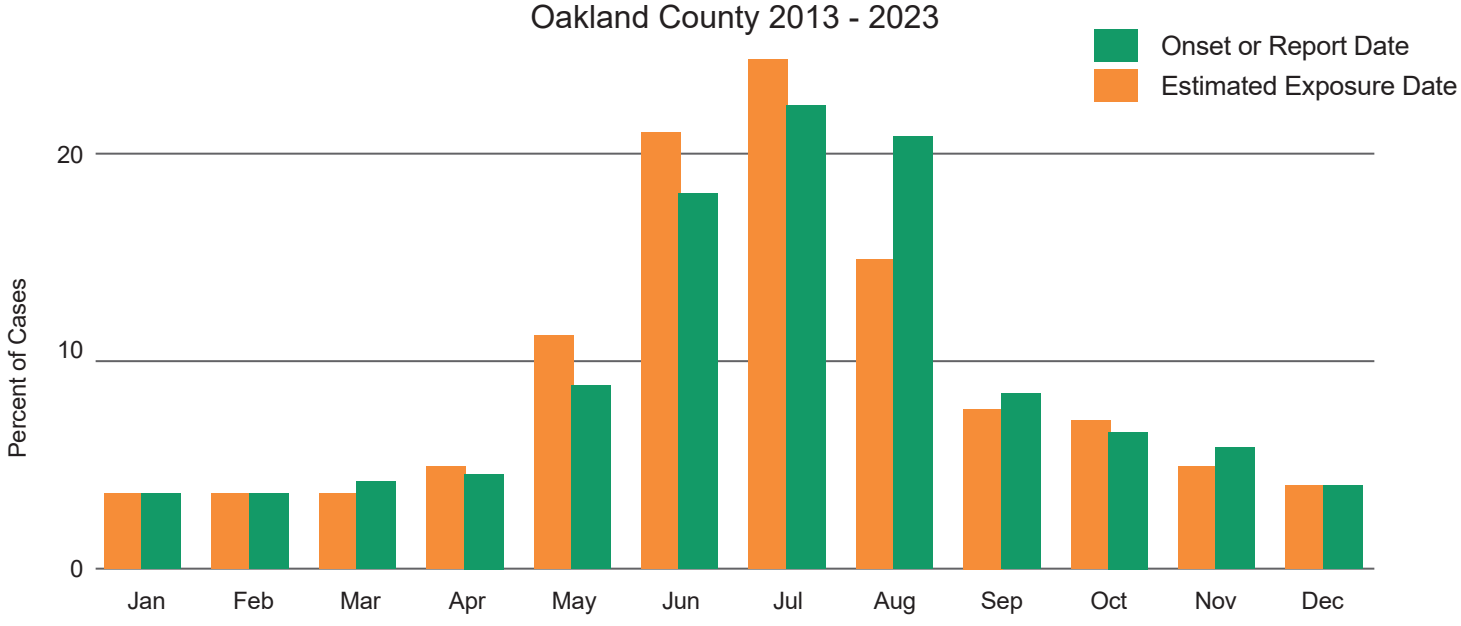


Michigan Disease Surveillance System

The incubation period for Lyme disease is 3 to 30 days with an average of 7 days. Because of this, tick exposures may have occurred in the month preceding onset of symptoms (CDC, Lyme Disease: Signs and Symptoms of Untreated Lyme Disease, 2024). Figure 5 below estimates the exposure date by subtracting 7 days from the onset or referral date. The highest number of tick exposures likely occurred in June and July when accounting for the average incubation period of reported cases.

Figure 5 • Lyme Disease Seasonality

Oakland County 2013 - 2023



Michigan Disease Surveillance System

County of Exposure

Historically, Lyme disease cases have been associated with travel to areas of the United States or within Michigan that have had a high incidence of Lyme disease. Within the last few years, Oakland County has experienced a marked increase in Lyme cases and more specifically, Lyme cases that are believed to be locally acquired (Figure 6). In 2023, 14.3% of Lyme cases were likely exposed in Oakland County. Leelanau County was the second highest probable exposure location for Oakland County residents (Figure 7). Figure 7 also depicts the difficulty in determining potential exposure locations. Many individuals report traveling to multiple locations within their incubation period or do not provide investigators with their travel history. As a result, OCHD CD unit staff were unable to determine the county of exposure for 54.8% of cases in 2023.

Figure 6 · Percent of Lyme Cases with Oakland County as Likely Exposure Location

Confirmed, Probable, and Suspect • Oakland County 2013 - 2023

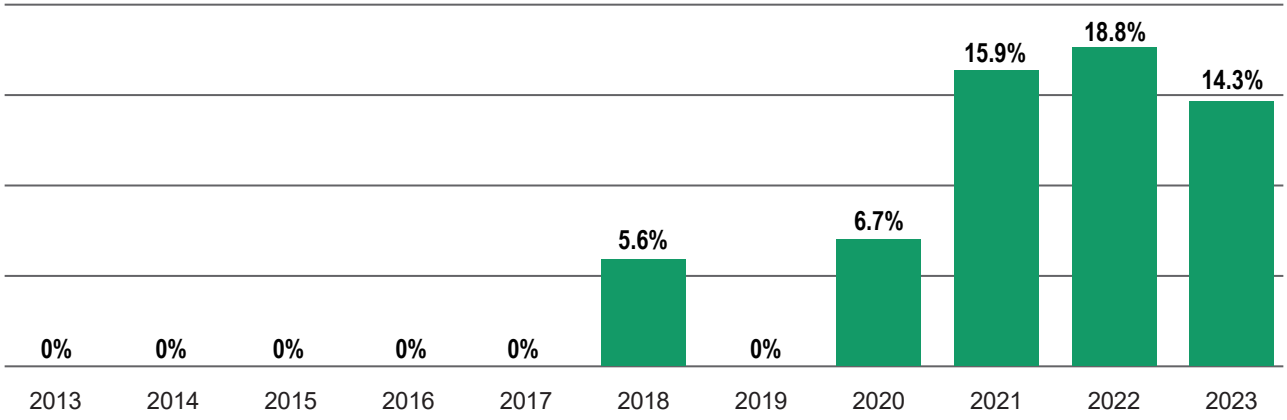
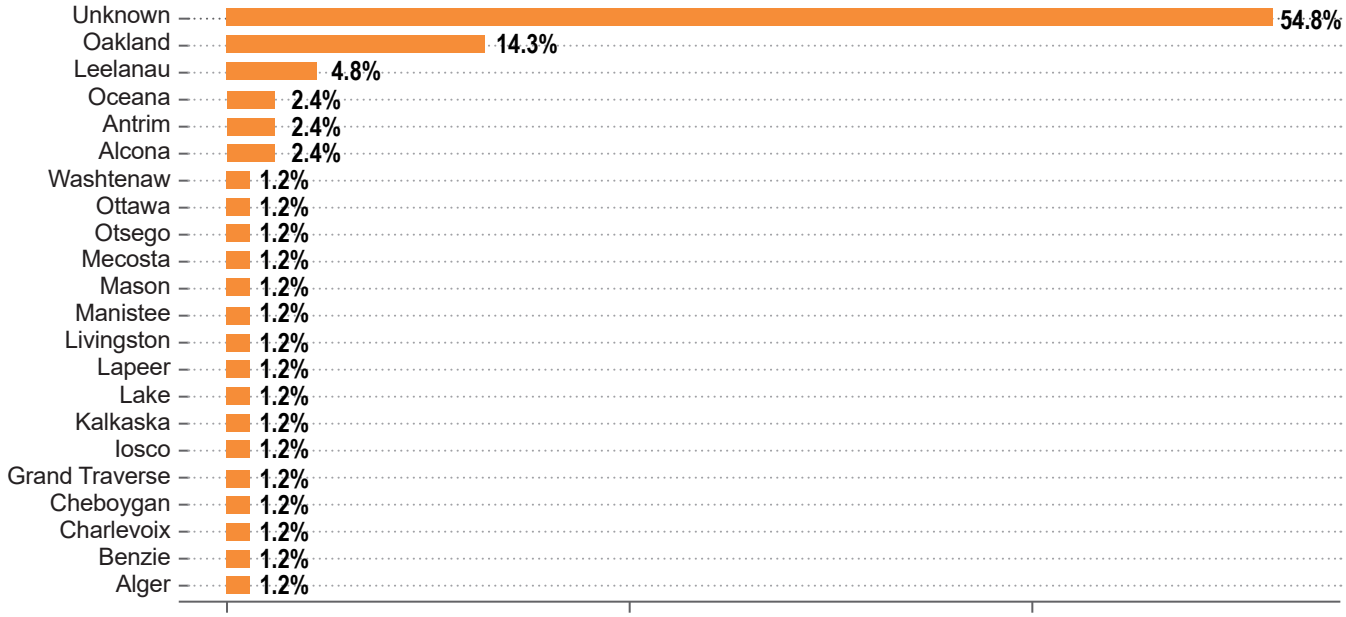


Figure 7 · Lyme Disease by Probable Place of Exposure

Oakland County 2013



Demographic Distribution of Cases 2013 - 2023

From 2013 to 2023, men accounted for 59.3% of reported Lyme disease cases in Oakland County (Figure 8). The age distribution of cases is moderately consistent across age groups, particularly from age group 20-29 through age group 60-69 (Figure 9). Note that Figure 9 does not account for differences in population size between each age group.

Figure 8 · Lyme Disease by Sex

Oakland County 2013 - 2023

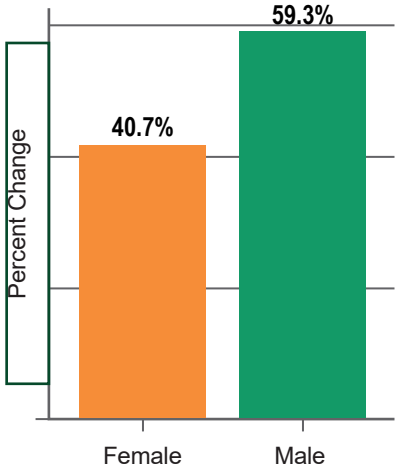


Figure 9 · Percent of Lyme Disease by Age Group

Oakland County 2013 - 2023

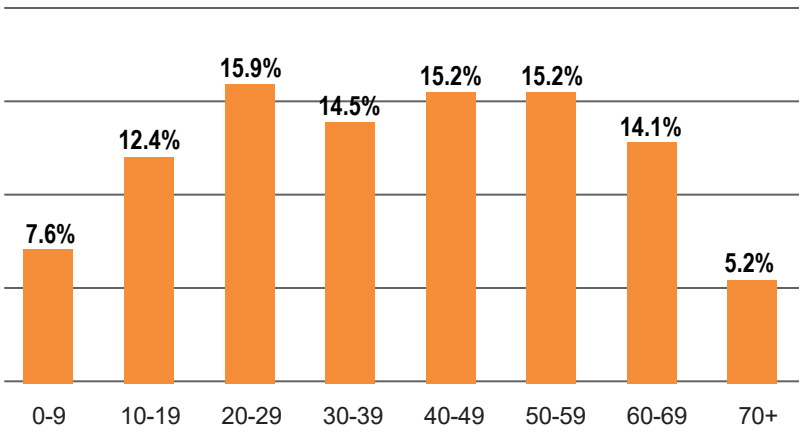


Figure 10 stratifies cases by age group and sex. Men between ages 20 and 29 account for the largest number of cases reported. There are more cases in women over the age of 70 than men in the same age group. There may be an increased risk for women in this age group, or this statistic may be the result of confounding factors such as more women than men or a higher level of physical ability in women of that age group.

Figure 10 · Lyme Disease by Age Group and Sex

Oakland County 2013 - 2023

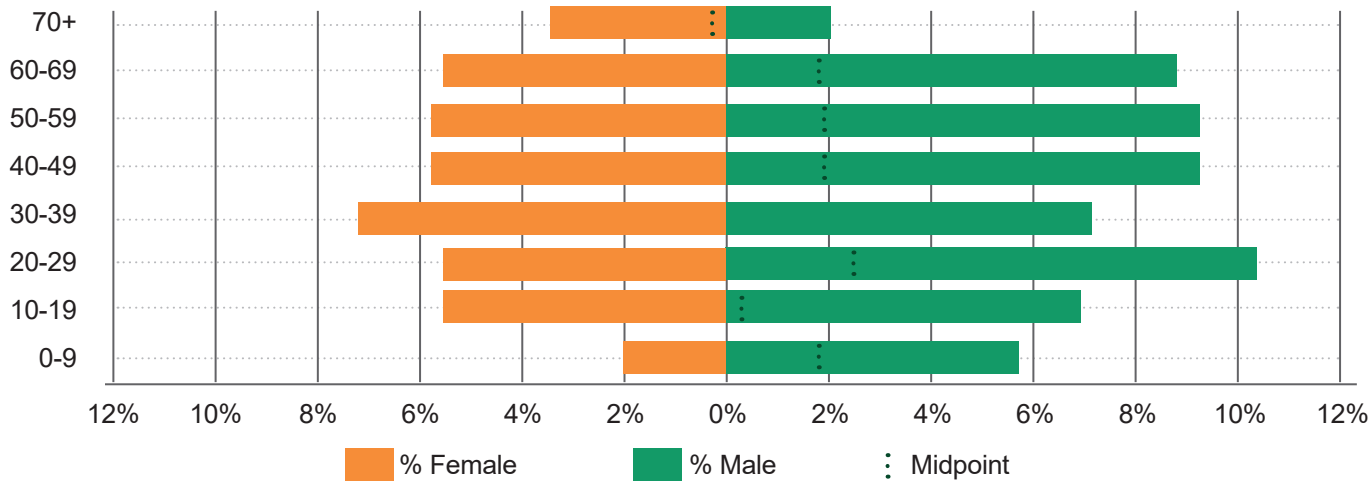
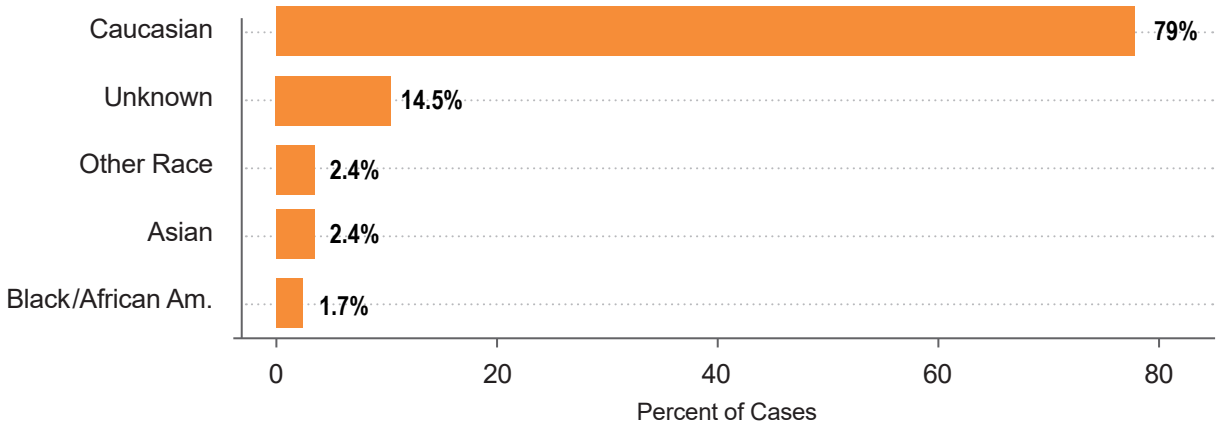


Figure 11 shows the race distribution of cases which is predominantly Caucasian (79%). Only 1.7% of cases identified as Black or African American, despite making up approximately 13.4% of the population of Oakland County per the 2020 Decennial Census (Bureau, n.d.). This disparity is likely multifactorial but may represent an underreporting or underdiagnosis of Lyme disease for the Black or African American population (Gould, 2024). A recent study from the Johns Hopkins Medicine Lyme Disease Research Center found black patients had 4.93 times the odds of later stage disseminated disease and had a longer time between onset of symptoms and receipt of appropriate antibiotic treatment (Starke SJ, 2023). Although this study has a small sample size of black participants (n=43), it corroborates the findings of other studies suggesting a disparity in diagnosis and treatment of Lyme disease in the black community (Kathryn M Hunt, 2023) (Gould, 2024). It is advised that clinicians recognize this disparity when treating Black or African American patients or those with darker skin tone.

Figure 11 · Lyme Disease by Race

Oakland County 2013 - 2023



Recommendations

Patient Counseling: Healthcare providers may consider providing educational materials to patients at general checkups and physicals on how to prevent tick exposures due to the increased risk of Lyme disease in Michigan and Oakland County. Information on preventing tick bites on humans can be found at https://www.cdc.gov/ticks/prevention/index.html.

Pets can also contract Lyme disease and bring ticks into the home. Veterinarians may consider increased counseling to their clients on how to best prevent ticks on pets.

Testing: With the increase in Lyme disease in Oakland County, it is recommended that providers consider Lyme as a part of their differential diagnosis when indicated. The pretest probability to determine whether testing is necessary for a patient can be found at https://www.cdc.gov/lyme/hcp/communication-resources/index.html

Early symptoms include fever, chills, headache, fatigue, muscle and joint aches, swollen lymph nodes, and an erythema migrans (EM) rash which is present in approximately 80% of cases. Late-stage symptoms include severe headaches and neck stiffness, disseminated EM rashes, facial palsy, arthritis with severe joint pain and swelling, pain in muscles, tendons, joints, and bones, heart palpitations or carditis, episodes of dizziness or shortness of breath, meningitis, nerve pain, and shooting pains, numbness, or tingling in the hands or feet. (CDC, Lyme Disease: Signs and Symptoms of Untreated Lyme Disease, 2024).

Because EMs are often underdiagnosed in individuals with darker skin tones (Kathryn M Hunt, 2023), providers should rely less on the presence of an EM when determining whether to test these patients for Lyme disease. This will decrease the probability of developing late-stage manifestations and improve the time from onset of symptoms to treatment receipt.

Serologic testing via a standard two-tiered test with an Enzyme Immunoassay (EIA) or Immunofluorescence Assay (IFA) reflexed to a Western Immunoblot (WB) is the current recommended test. A modified two-tiered test with two EIAs can also be used in Lyme diagnostics. (Mead P, 2019).

Treatment: For acute Lyme disease presenting with an EM rash, treatment with Doxycycline (10-14 days), Amoxicillin (14 days), or Cefuroxime (14 days) is recommended (CDC, Clinical Care of Lyme Disease, 2024). Access additional dosing information and treatment for cases with neurologic involvement, Lyme carditis, or Lyme arthritis at: https://www.cdc.gov/lyme/hcp/clinical-care/erythema-migrans-rash.html.

After initial treatment, some cases may still experience symptoms such as fatigue, impaired cognitive function, muscle and joint aches, unexplained numbness, or persistent pain. These patients may be diagnosed with post-treatment Lyme disease syndrome (PTLDS). Currently, the use of extended antibiotic therapy for PTLDS is not recommended, however, further research is needed. ((NIAID), 2018) (CDC, Chronic Symptoms and Lyme Disease, 2024).

Post Exposure Prophylaxis (PEP): Post exposure prophylaxis or PEP may be indicated after a blacklegged tick bite if the following conditions are met:

1. Where the tick bite occurred, are the ticks likely to be infected with the bacteria Borrelia burgdorferi? Due to the increase of Lyme disease in Oakland County, tick exposures that occur here should be considered to have potentially been infected with Borrelia burgdorferi.
2. Was the tick removed in the last 72 hours? PEP is most effective within the 72-hour window after tick removal.
3. Was the tick's body engorged indicating it had taken a blood meal?
4. Was the tick a blacklegged tick? If unsure, contact the Oakland County Communicable Diseases Unit at 248-858-1286 or email a picture to the Michigan Department of Health and Human Services at MDHHS-Bugs@Michigan.gov. Pictures should be of both sides of the tick, with ample lighting and as close as possible without losing image quality.
5. Is Doxycycline safe for the patient?

If all five criteria are met, a single dose of Doxycycline (200 mg for adults or 4.4 mg/kg for children of any age weighing less than 45 kg) may be considered to decrease the risk of developing Lyme disease after a tick bite. (CDC, Lyme Disease Prophylaxis After Tick Bite, 2021).

References

(CDC), C. f. (2021, August 30). National Notifiable Diseases Surveillance System (NNDSS): Lyme Disease (Borrelia burgdorferi) 2022 Case Definition. Retrieved from ndc.services.CDC.gov: https://ndc.services.cdc.gov/case-definitions/lyme-disease-2022/

(EPA), U. S. (2024, June 27). Climate Change Indicators: Lyme Disease. Retrieved from EPA.gov: https://www.epa.gov/climate-indicators/climate-change-indicators-lyme-disease

(MDHHS), M. D. (2023, October). 2022 Michigan Emerging and Zoonotic Disease Surveillance Summary. Retrieved from Michigan.gov/emergingdiseases:https://www.michigan.gov/emergingdiseases/-/media/Project/Websites/emergingdiseases/EZID_Annual_Surveillance_Summary.pdf?rev=26725ec88cf545d980d5dbeec7c7f53a

(NIAID), N. I. (2018, November 20). Lyme Disease Antibiotic Treatment Research. Retrieved from NIAID.NIH.gov: https://www.niaid.nih.gov/diseases-conditions/lyme-disease-antibiotic-treatment-research

Beard, C. R. (2016). Chapter 5: Vector-borne diseases. In: The impacts of climate change on human health in the United States: A scientific assessment. U.S. Global Change Research Program, Chapter 5. Retrieved from https://health2016.globalchange.gov

Bureau, U. S. (n.d.). Oakland County, Michigan. Retrieved from United States Census Bureau: https://data.census.gov/profile/Oakland_County,_Michigan?g=050XX00US26125#race-and-ethnicity

CDC. (2021). Lyme Disease Prophylaxis After Tick Bite. Retrieved from CDC.gov: https://www.cdc.gov/lyme/resources/pdfs/lyme-pep-low-ink-p.pdf

CDC. (2024, May 15). Chronic Symptoms and Lyme Disease. Retrieved from CDC.gov: https://www.cdc.gov/lyme/signs-symptoms/chronic-symptoms-and-lyme-disease.html

CDC. (2024, May 15). Clinical Care of Lyme Disease. Retrieved from CDC.gov: https://www.cdc.gov/lyme/hcp/clinical-care/index.html

CDC. (2024, May 15). Lyme Disease: How Lyme Spreads. Retrieved from CDC.gov: https://www.cdc.gov/lyme/causes/index.html

CDC. (2024, May 15). Lyme Disease: Signs and Symptoms of Untreated Lyme Disease. Retrieved from CDC.gov: https://www.cdc.gov/lyme/signs-symptoms/index.html#:~:text=Early%20signs%20and%20symptoms%20(3%20to%2030%20days%20after%20tick%20bite)&text=Occurs%20in%20approximately%2070%20to,30%20cm)%20or%20more%20across

CDC. (2024, June 11). Preventing Tick Bites. Retrieved from CDC.gov: https://www.cdc.gov/ticks/prevention/index.html

Gould, L. H. (2024). Racial and ethnic disparities in Lyme disease in the United States. Zoonosis and Public Health, 71(5), 457-608. doi:https://doi.org/10.1111/zph.13137

Kathryn M Hunt, K. A. (2023). Racial Differences in the Diagnosis of Lyme Disease in Children. Clinical Infectious Disease, 76(6), 1129-1131. doi:https://doi.org/10.1093/cid/ciac863

Mead P, P. J. (2019, August 16). Updated CDC Recommendation for Serologic Diagnosis of Lyme Disease. Morbidity and Mortality Weekly Report (MMWR), 68(32), 703. doi: http://dx.doi.org/10.15585/mmwr.mm6832a4

Starke SJ, R. A. (2023). Time to Diagnosis and Treatment of Lyme Disease by Patient Race. 6(12).